FIG.1

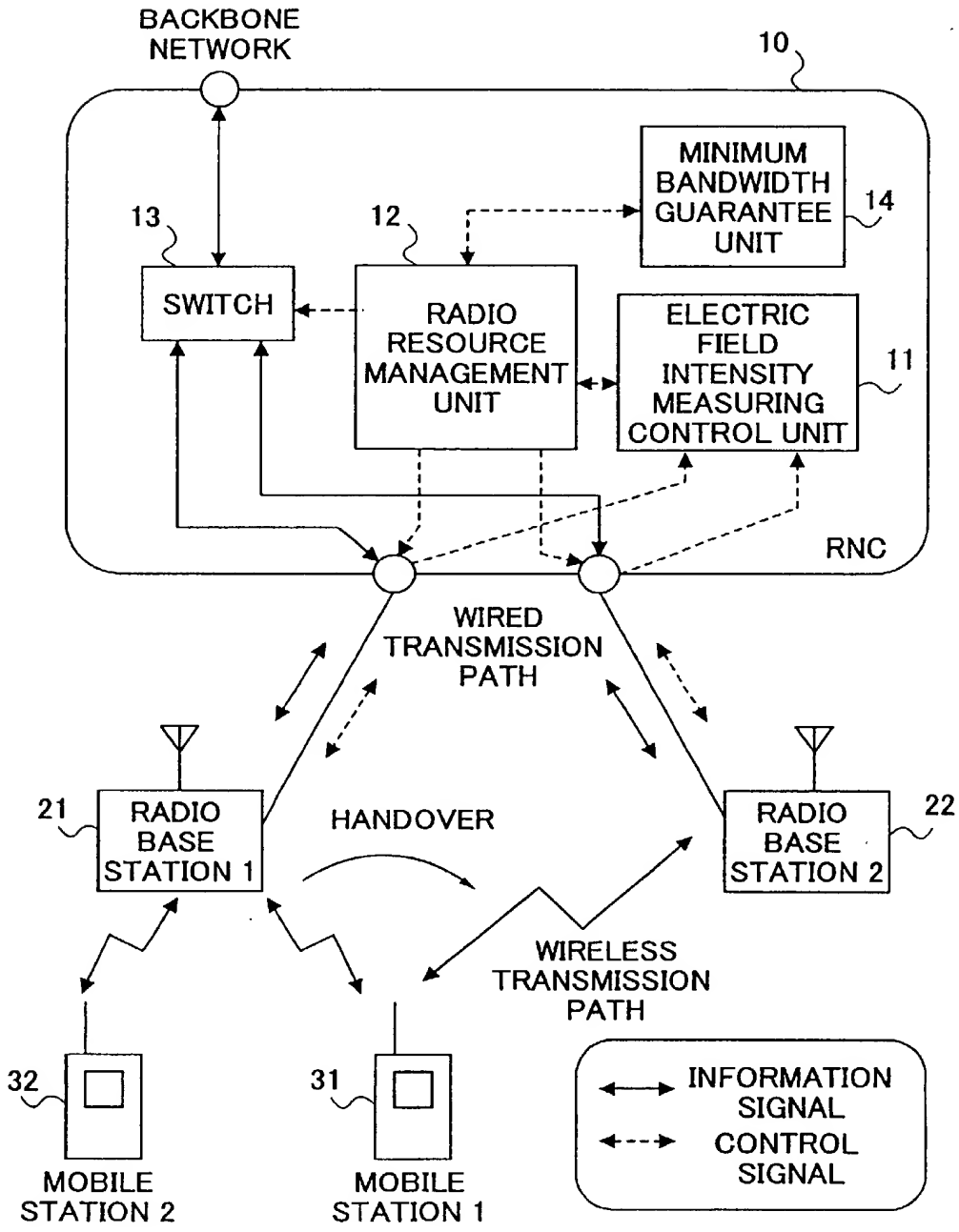

BACKBONE NETWORK
10
MINIMUM BANDWIDTH GUARANTEE UNIT
14
13
12
SWITCH
RADIO RESOURCE MANAGEMENT UNIT
ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT
11
RNC
WIRED TRANSMISSION PATH
21
RADIO BASE STATION 1
HANDOVER
RADIO BASE STATION 2
22
WIRELESS TRANSMISSION PATH
32
31
MOBILE STATION 2
MOBILE STATION 1
INFORMATION SIGNAL
CONTROL SIGNAL

FIG.2

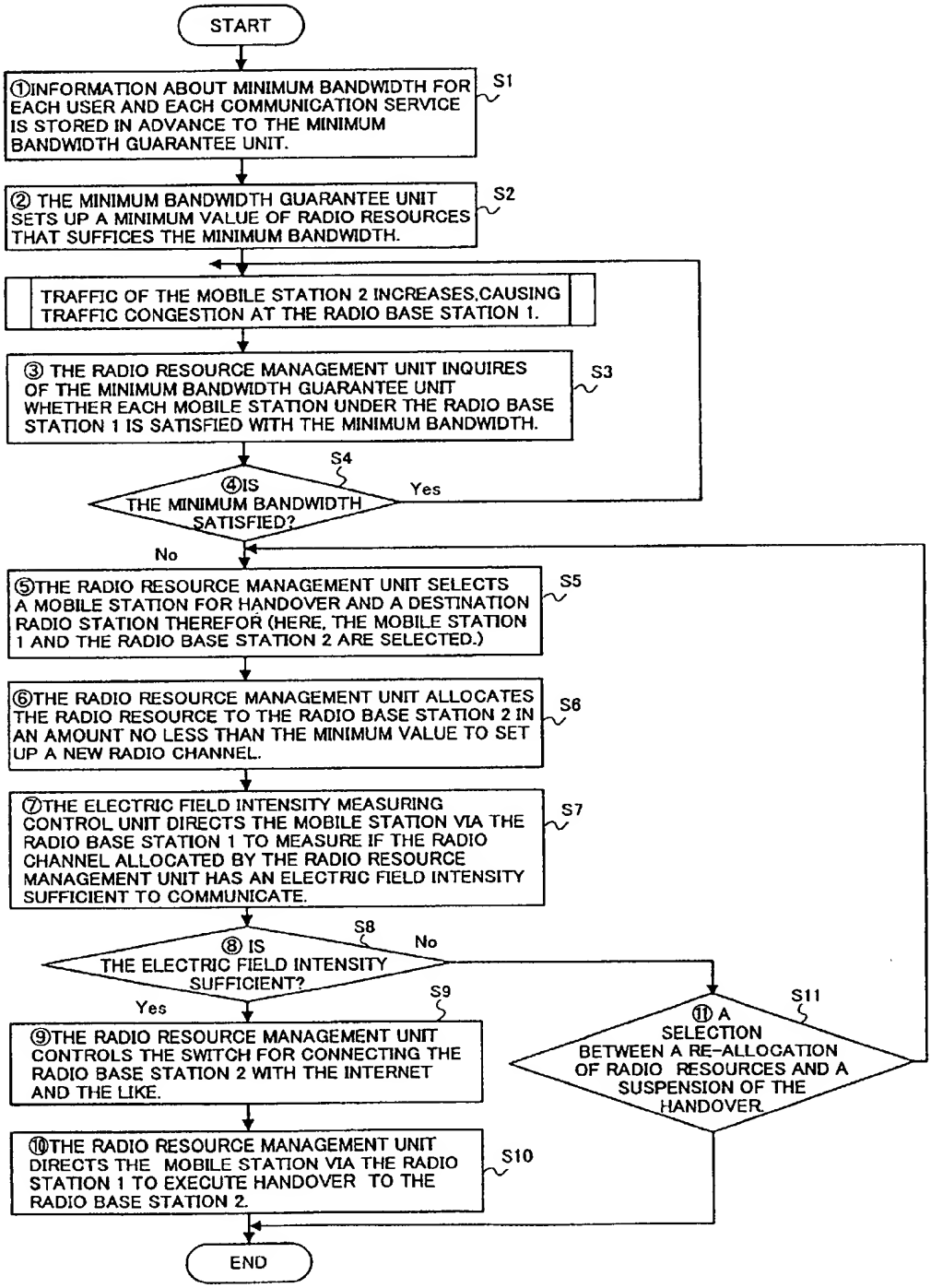

START
①INFORMATION ABOUT MINIMUM BANDWIDTH FOR EACH USER AND EACH COMMUNICATION SERVICE IS STORED IN ADVANCE TO THE MINIMUM BANDWIDTH GUARANTEE UNIT.
S1
② THE MINIMUM BANDWIDTH GUARANTEE UNIT SETS UP A MINIMUM VALUE OF RADIO RESOURCES THAT SUFFICES THE MINIMUM BANDWIDTH.
S2
TRAFFIC OF THE MOBILE STATION 2 INCREASES,CAUSING TRAFFIC CONGESTION AT THE RADIO BASE STATION 1.
③ THE RADIO RESOURCE MANAGEMENT UNIT INQUIRES OF THE MINIMUM BANDWIDTH GUARANTEE UNIT WHETHER EACH MOBILE STATION UNDER THE RADIO BASE STATION 1 IS SATISFIED WITH THE MINIMUM BANDWIDTH.
S3
S4
④IS THE MINIMUM BANDWIDTH SATISFIED?
Yes
No
⑤THE RADIO RESOURCE MANAGEMENT UNIT SELECTS A MOBILE STATION FOR HANDOVER AND A DESTINATION RADIO STATION THEREFOR (HERE, THE MOBILE STATION 1 AND THE RADIO BASE STATION 2 ARE SELECTED.)
S5
⑥THE RADIO RESOURCE MANAGEMENT UNIT ALLOCATES THE RADIO RESOURCE TO THE RADIO BASE STATION 2 IN AN AMOUNT NO LESS THAN THE MINIMUM VALUE TO SET UP A NEW RADIO CHANNEL.
S6
⑦THE ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT DIRECTS THE MOBILE STATION VIA THE RADIO BASE STATION 1 TO MEASURE IF THE RADIO CHANNEL ALLOCATED BY THE RADIO RESOURCE MANAGEMENT UNIT HAS AN ELECTRIC FIELD INTENSITY SUFFICIENT TO COMMUNICATE.
S7
S8
⑧ IS THE ELECTRIC FIELD INTENSITY SUFFICIENT?
No
Yes
S9
⑨THE RADIO RESOURCE MANAGEMENT UNIT CONTROLS THE SWITCH FOR CONNECTING THE RADIO BASE STATION 2 WITH THE INTERNET AND THE LIKE.
⑩THE RADIO RESOURCE MANAGEMENT UNIT DIRECTS THE MOBILE STATION VIA THE RADIO STATION 1 TO EXECUTE HANDOVER TO THE RADIO BASE STATION 2.
S10
S11
⑪ A SELECTION BETWEEN A RE-ALLOCATION OF RADIO RESOURCES AND A SUSPENSION OF THE HANDOVER
END

FIG.3

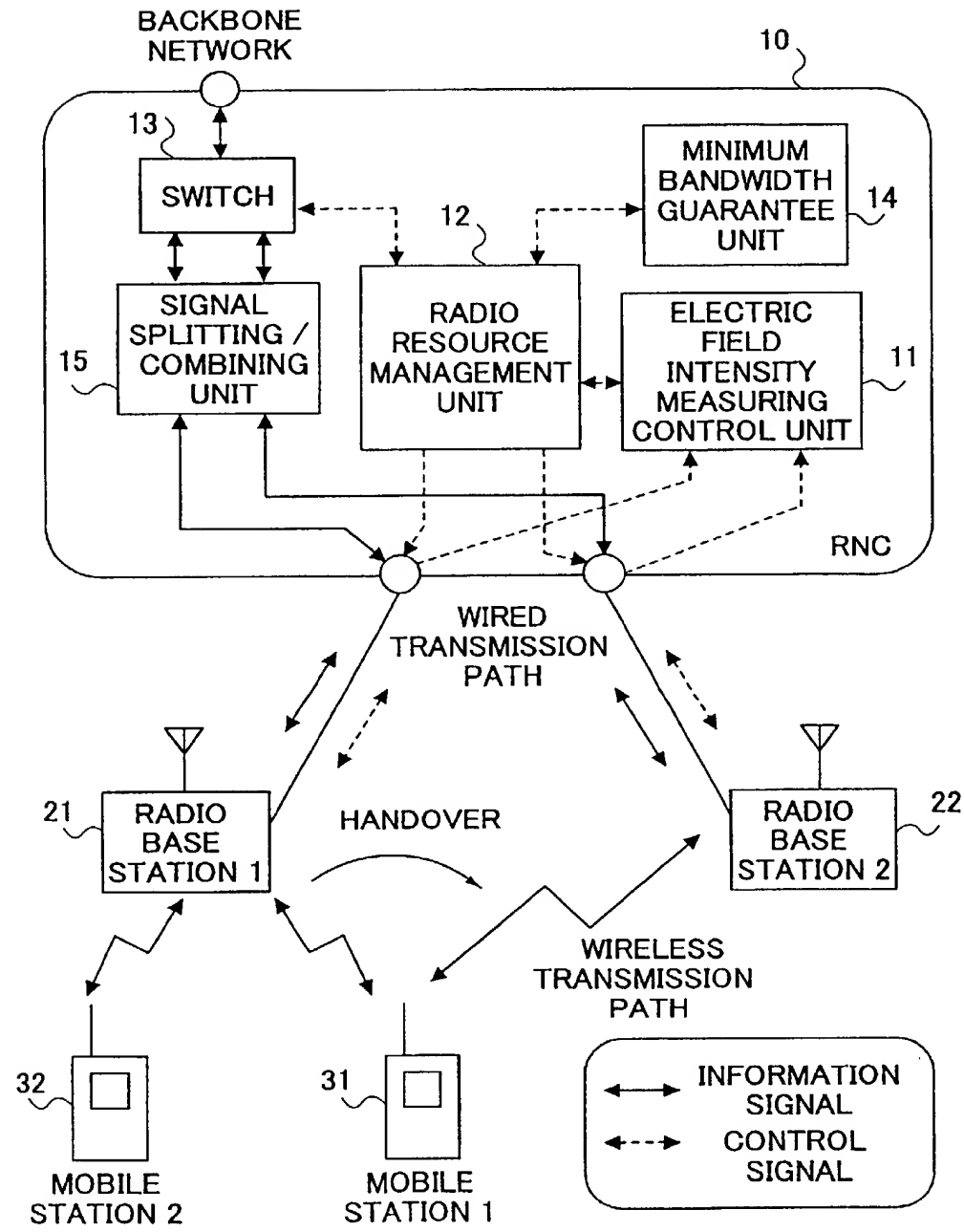

BACKBONE NETWORK
10
13
SWITCH
12
MINIMUM BANDWIDTH GUARANTEE UNIT
14
SIGNAL SPLITTING / COMBINING UNIT
15
RADIO RESOURCE MANAGEMENT UNIT
ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT
11
RNC
WIRED TRANSMISSION PATH
21
RADIO BASE STATION 1
HANDOVER
RADIO BASE STATION 2
22
WIRELESS TRANSMISSION PATH
32
31
MOBILE STATION 2
MOBILE STATION 1
INFORMATION SIGNAL
CONTROL SIGNAL

FIG.4

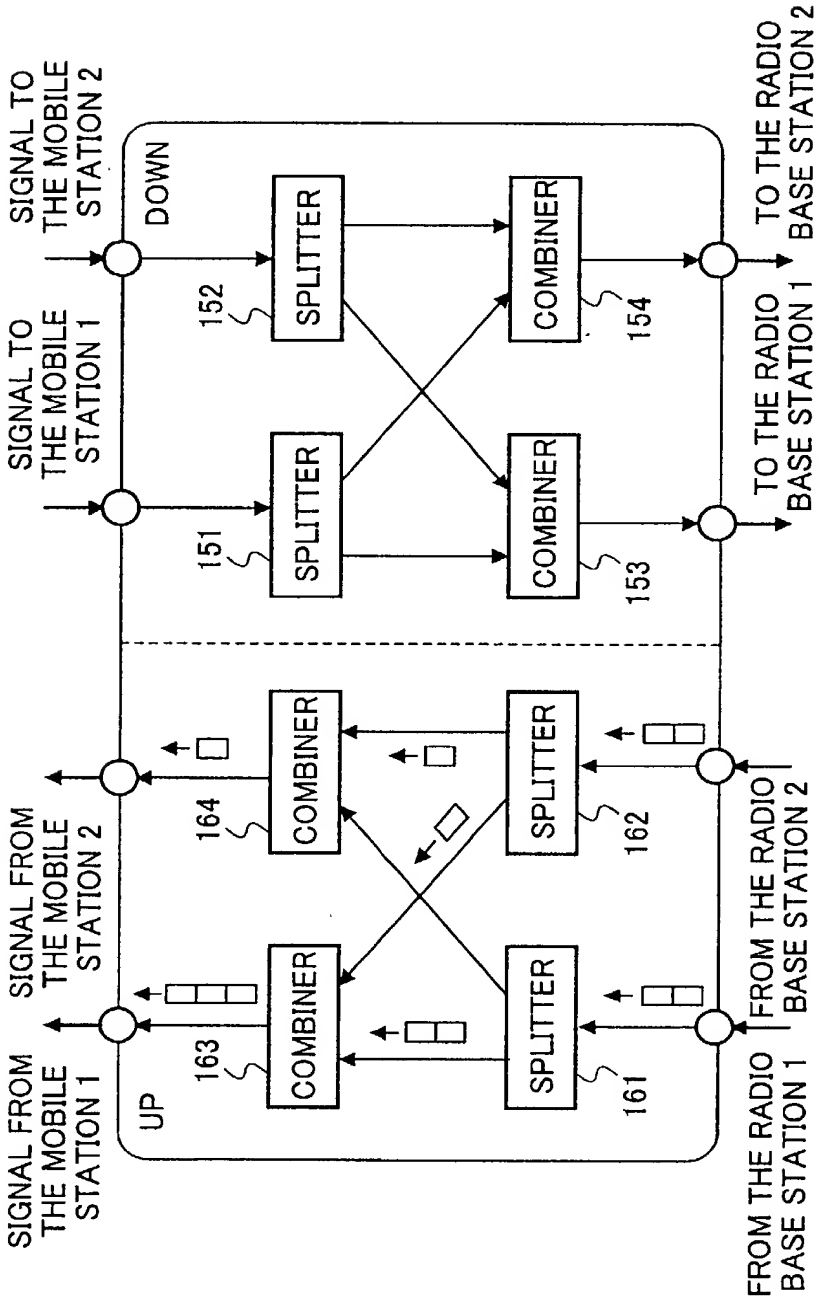

FROM SW
TO SW
SIGNAL TO THE MOBILE STATION 1
SIGNAL TO THE MOBILE STATION 2
SIGNAL FROM THE MOBILE STATION 1
SIGNAL FROM THE MOBILE STATION 2
DOWN
UP
SPLITTER
COMBINER
151
152
153
154
161
162
163
164
TO THE RADIO BASE STATION 1
TO THE RADIO BASE STATION 2
FROM THE RADIO BASE STATION 1
FROM THE RADIO BASE STATION 2

FIG.5

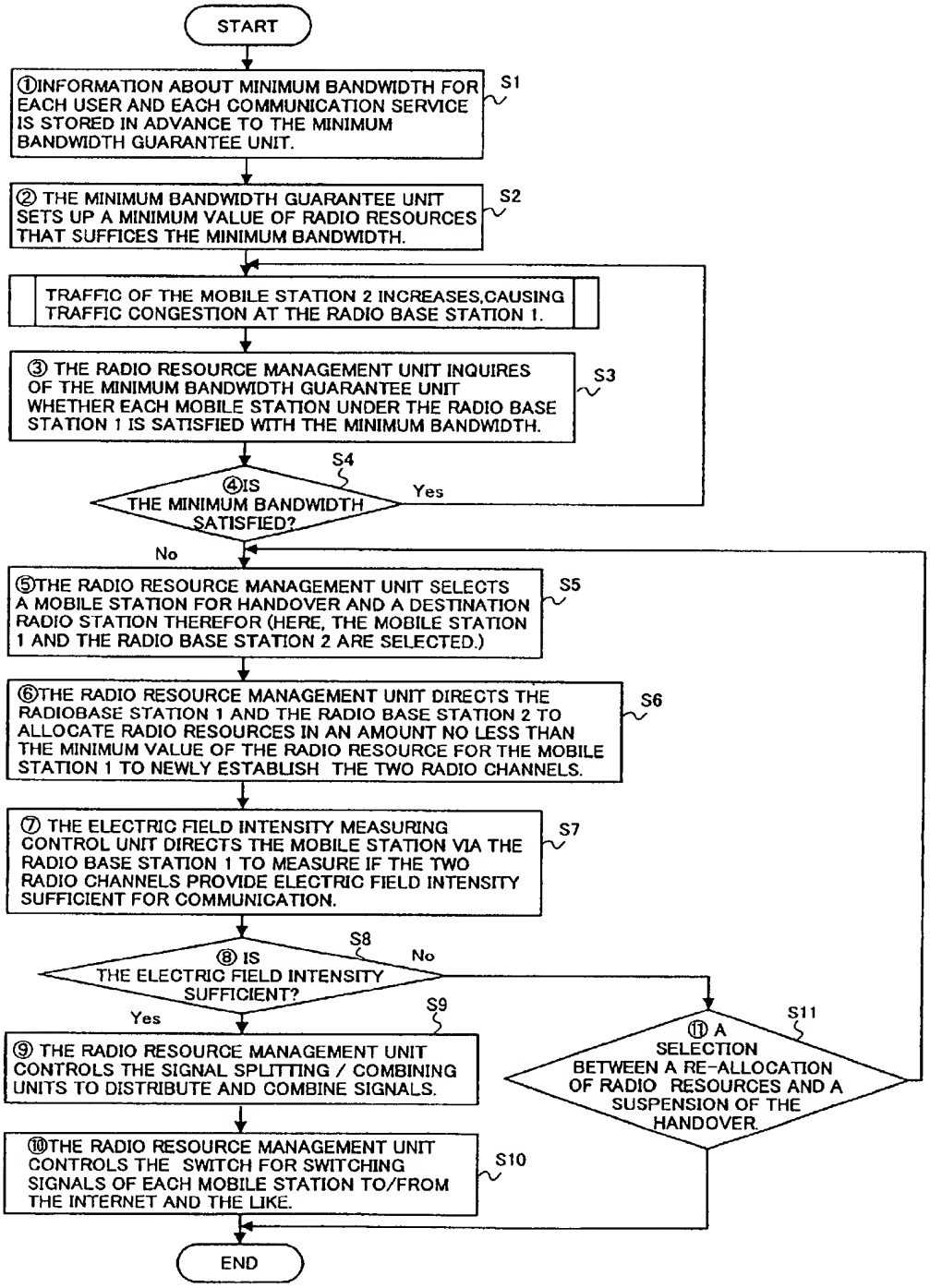

START
①INFORMATION ABOUT MINIMUM BANDWIDTH FOR EACH USER AND EACH COMMUNICATION SERVICE IS STORED IN ADVANCE TO THE MINIMUM BANDWIDTH GUARANTEE UNIT.
S1
② THE MINIMUM BANDWIDTH GUARANTEE UNIT SETS UP A MINIMUM VALUE OF RADIO RESOURCES THAT SUFFICES THE MINIMUM BANDWIDTH.
S2
TRAFFIC OF THE MOBILE STATION 2 INCREASES,CAUSING TRAFFIC CONGESTION AT THE RADIO BASE STATION 1.
③ THE RADIO RESOURCE MANAGEMENT UNIT INQUIRES OF THE MINIMUM BANDWIDTH GUARANTEE UNIT WHETHER EACH MOBILE STATION UNDER THE RADIO BASE STATION 1 IS SATISFIED WITH THE MINIMUM BANDWIDTH.
S3
S4
④IS THE MINIMUM BANDWIDTH SATISFIED?
Yes
No
⑤THE RADIO RESOURCE MANAGEMENT UNIT SELECTS A MOBILE STATION FOR HANDOVER AND A DESTINATION RADIO STATION THEREFOR (HERE, THE MOBILE STATION 1 AND THE RADIO BASE STATION 2 ARE SELECTED.)
S5
⑥THE RADIO RESOURCE MANAGEMENT UNIT DIRECTS THE RADIOBASE STATION 1 AND THE RADIO BASE STATION 2 TO ALLOCATE RADIO RESOURCES IN AN AMOUNT NO LESS THAN THE MINIMUM VALUE OF THE RADIO RESOURCE FOR THE MOBILE STATION 1 TO NEWLY ESTABLISH THE TWO RADIO CHANNELS.
S6
⑦ THE ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT DIRECTS THE MOBILE STATION VIA THE RADIO BASE STATION 1 TO MEASURE IF THE TWO RADIO CHANNELS PROVIDE ELECTRIC FIELD INTENSITY SUFFICIENT FOR COMMUNICATION.
S7
S8
⑧ IS THE ELECTRIC FIELD INTENSITY SUFFICIENT?
No
Yes
S9
⑨ THE RADIO RESOURCE MANAGEMENT UNIT CONTROLS THE SIGNAL SPLITTING / COMBINING UNITS TO DISTRIBUTE AND COMBINE SIGNALS.
S11
⑪ A SELECTION BETWEEN A RE-ALLOCATION OF RADIO RESOURCES AND A SUSPENSION OF THE HANDOVER.
⑩THE RADIO RESOURCE MANAGEMENT UNIT CONTROLS THE SWITCH FOR SWITCHING SIGNALS OF EACH MOBILE STATION TO/FROM THE INTERNET AND THE LIKE.
S10
END

FIG.6

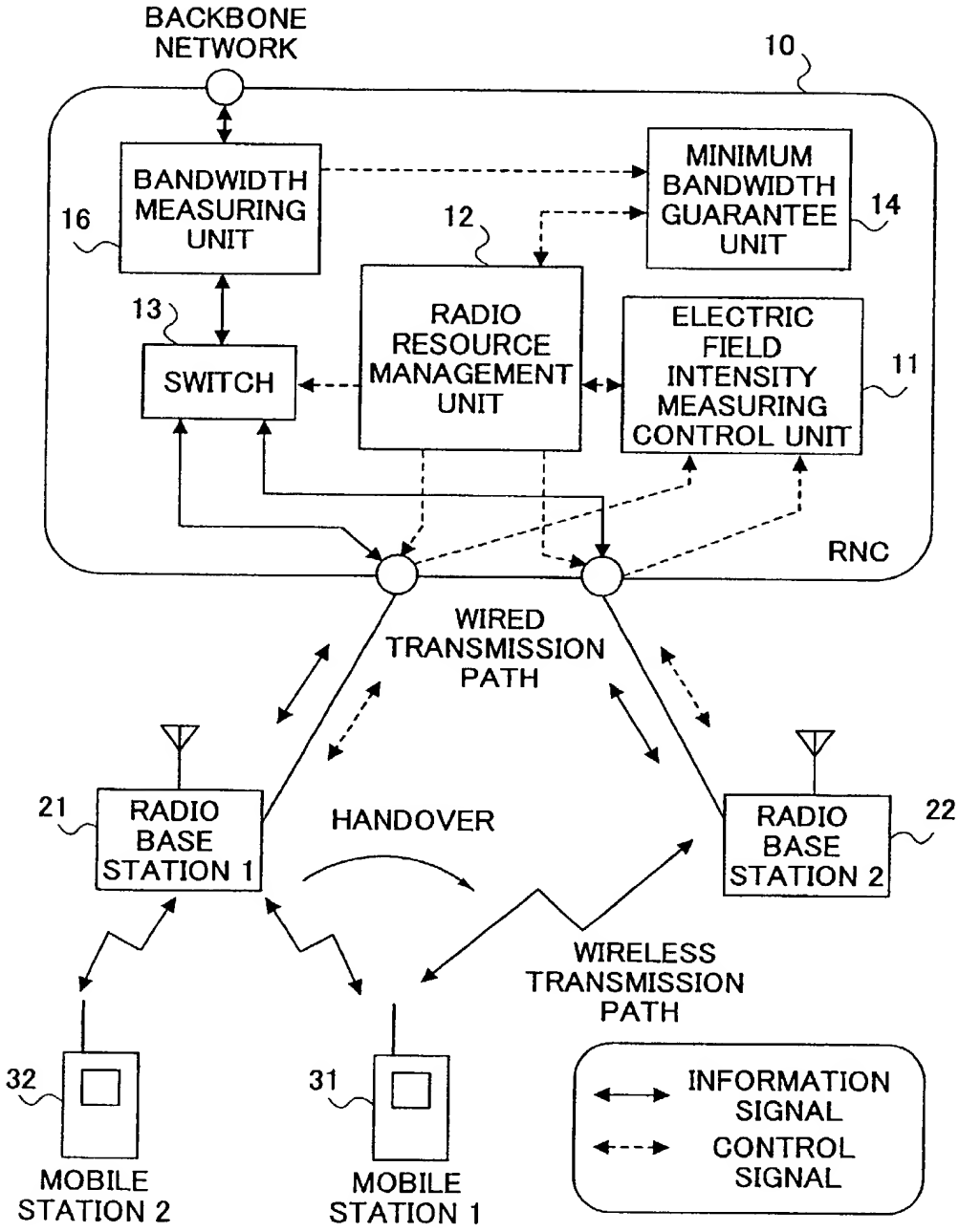

BACKBONE NETWORK
10
BANDWIDTH MEASURING UNIT
16
MINIMUM BANDWIDTH GUARANTEE UNIT
14
12
13
SWITCH
RADIO RESOURCE MANAGEMENT UNIT
ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT
11
RNC
WIRED TRANSMISSION PATH
21
RADIO BASE STATION 1
HANDOVER
RADIO BASE STATION 2
22
WIRELESS TRANSMISSION PATH
32
31
MOBILE STATION 2
MOBILE STATION 1
INFORMATION SIGNAL
CONTROL SIGNAL

FIG.7

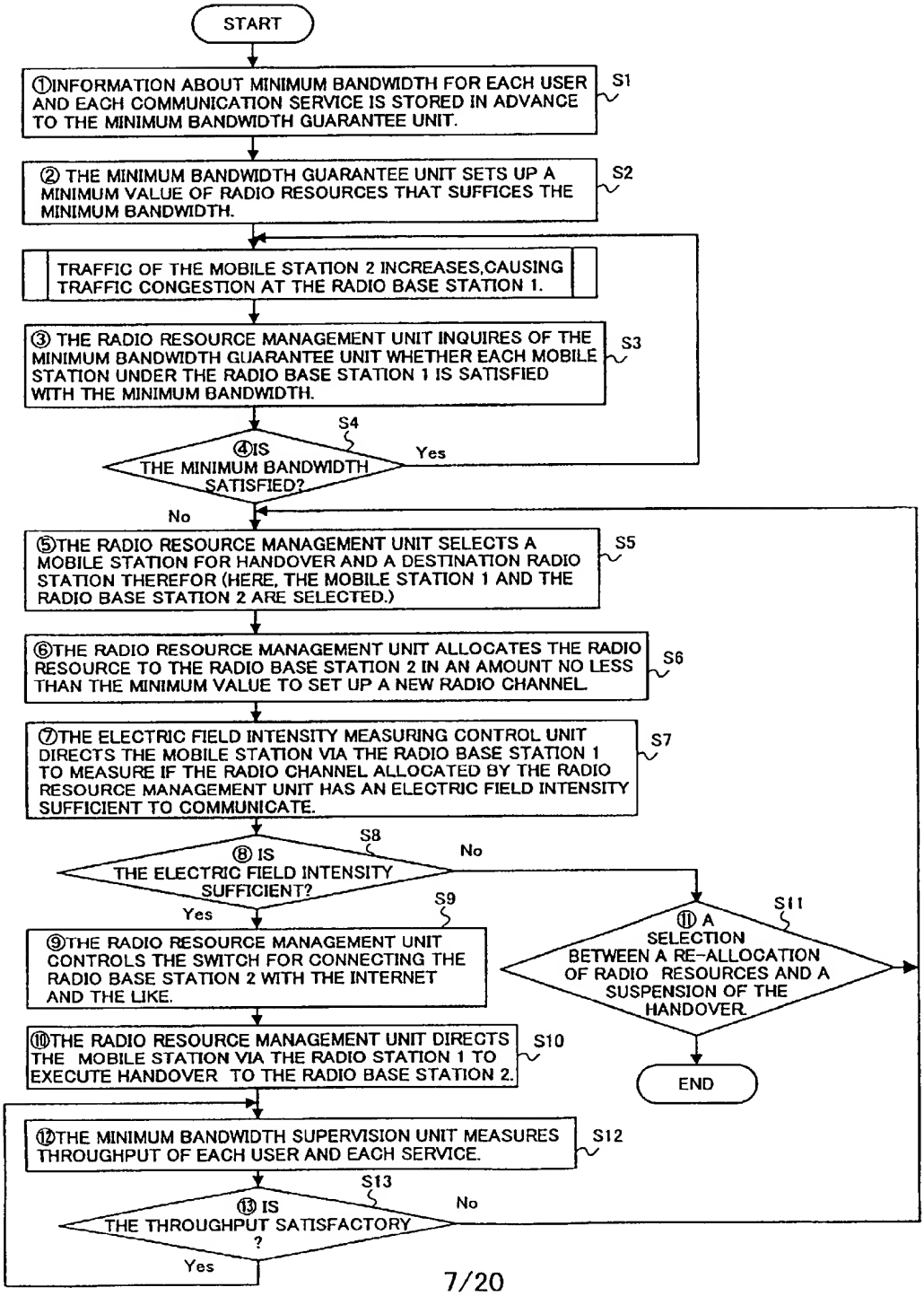

START
①INFORMATION ABOUT MINIMUM BANDWIDTH FOR EACH USER AND EACH COMMUNICATION SERVICE IS STORED IN ADVANCE TO THE MINIMUM BANDWIDTH GUARANTEE UNIT.
S1
② THE MINIMUM BANDWIDTH GUARANTEE UNIT SETS UP A MINIMUM VALUE OF RADIO RESOURCES THAT SUFFICES THE MINIMUM BANDWIDTH.
S2
TRAFFIC OF THE MOBILE STATION 2 INCREASES,CAUSING TRAFFIC CONGESTION AT THE RADIO BASE STATION 1.
③ THE RADIO RESOURCE MANAGEMENT UNIT INQUIRES OF THE MINIMUM BANDWIDTH GUARANTEE UNIT WHETHER EACH MOBILE STATION UNDER THE RADIO BASE STATION 1 IS SATISFIED WITH THE MINIMUM BANDWIDTH.
S3
S4
④IS THE MINIMUM BANDWIDTH SATISFIED?
Yes
No
⑤THE RADIO RESOURCE MANAGEMENT UNIT SELECTS A MOBILE STATION FOR HANDOVER AND A DESTINATION RADIO STATION THEREFOR (HERE, THE MOBILE STATION 1 AND THE RADIO BASE STATION 2 ARE SELECTED.)
S5
⑥THE RADIO RESOURCE MANAGEMENT UNIT ALLOCATES THE RADIO RESOURCE TO THE RADIO BASE STATION 2 IN AN AMOUNT NO LESS THAN THE MINIMUM VALUE TO SET UP A NEW RADIO CHANNEL.
S6
⑦THE ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT DIRECTS THE MOBILE STATION VIA THE RADIO BASE STATION 1 TO MEASURE IF THE RADIO CHANNEL ALLOCATED BY THE RADIO RESOURCE MANAGEMENT UNIT HAS AN ELECTRIC FIELD INTENSITY SUFFICIENT TO COMMUNICATE.
S7
S8
⑧ IS THE ELECTRIC FIELD INTENSITY SUFFICIENT?
No
Yes
S9
⑨THE RADIO RESOURCE MANAGEMENT UNIT CONTROLS THE SWITCH FOR CONNECTING THE RADIO BASE STATION 2 WITH THE INTERNET AND THE LIKE.
S11
⑪ A SELECTION BETWEEN A RE-ALLOCATION OF RADIO RESOURCES AND A SUSPENSION OF THE HANDOVER.
END
⑩THE RADIO RESOURCE MANAGEMENT UNIT DIRECTS THE MOBILE STATION VIA THE RADIO STATION 1 TO EXECUTE HANDOVER TO THE RADIO BASE STATION 2.
S10
⑫THE MINIMUM BANDWIDTH SUPERVISION UNIT MEASURES THROUGHPUT OF EACH USER AND EACH SERVICE.
S12
S13
⑬ IS THE THROUGHPUT SATISFACTORY ?
No
Yes

FIG.8

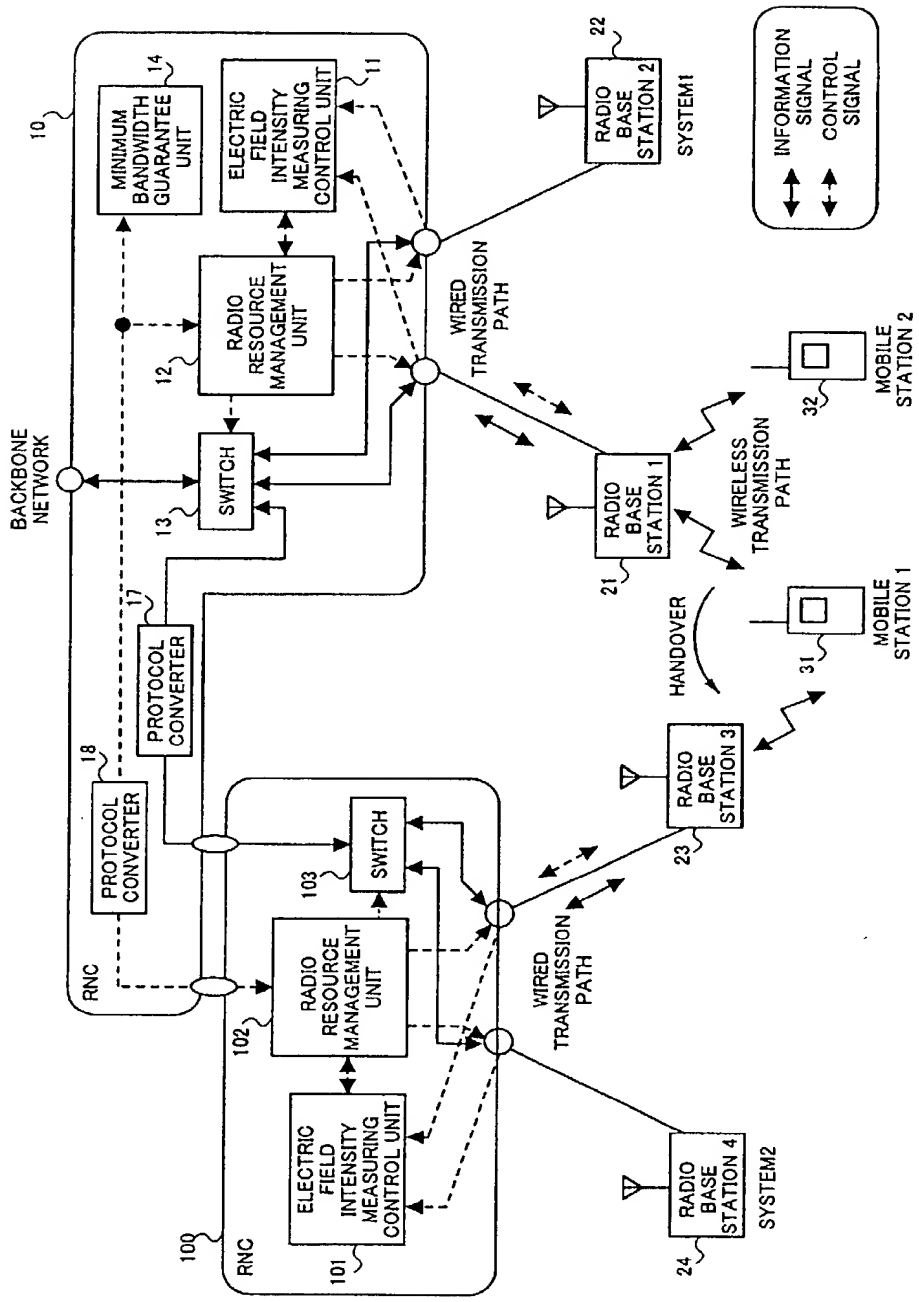

10
MINIMUM BANDWIDTH GUARANTEE UNIT
14
ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT
11
RADIO RESOURCE MANAGEMENT UNIT
12
SWITCH
13
BACKBONE NETWORK
PROTOCOL CONVERTER
17
PROTOCOL CONVERTER
18
RNC
100
SWITCH
103
RADIO RESOURCE MANAGEMENT UNIT
102
ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT
101
RNC
WIRED TRANSMISSION PATH
WIRED TRANSMISSION PATH
RADIO BASE STATION 2
22
SYSTEM1
RADIO BASE STATION 1
21
RADIO BASE STATION 3
23
RADIO BASE STATION 4
24
SYSTEM2
WIRELESS TRANSMISSION PATH
HANDOVER
MOBILE STATION 2
32
MOBILE STATION 1
31
INFORMATION SIGNAL
CONTROL SIGNAL

FIG.9

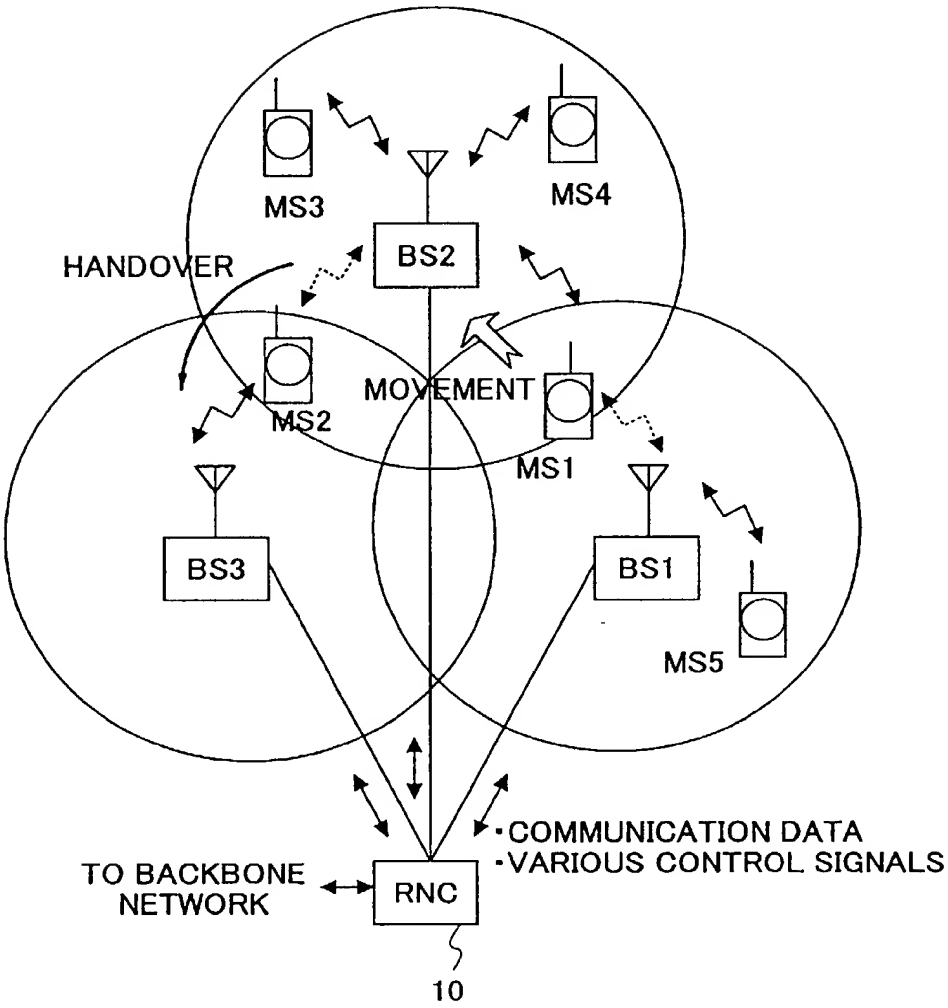

MS3
MS4
HANDOVER
BS2
MS2
MOVEMENT
MS1
BS3
BS1
MS5
COMMUNICATION DATA
VARIOUS CONTROL SIGNALS
TO BACKBONE NETWORK
RNC
10

FIG.10

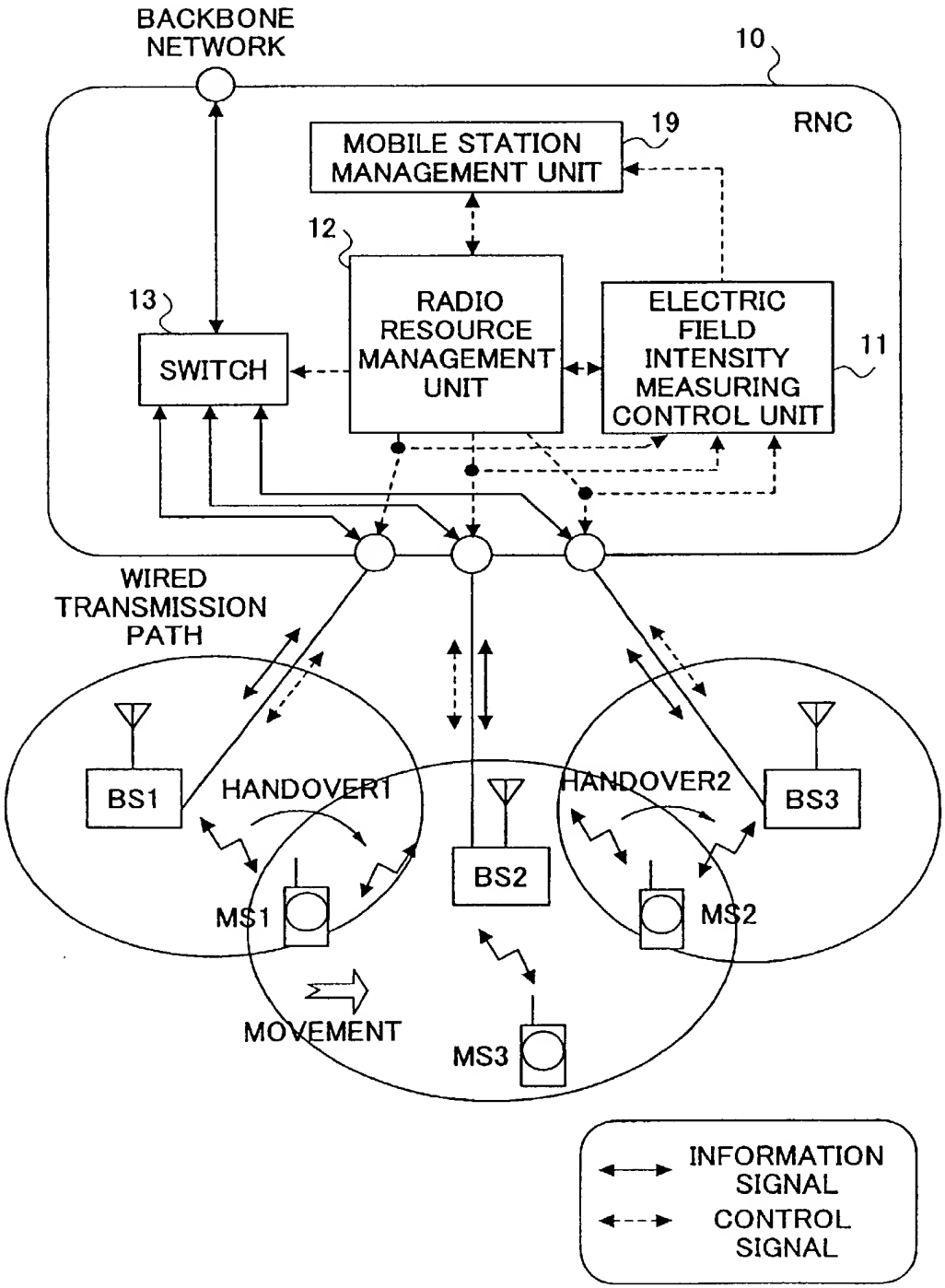


FIG.11

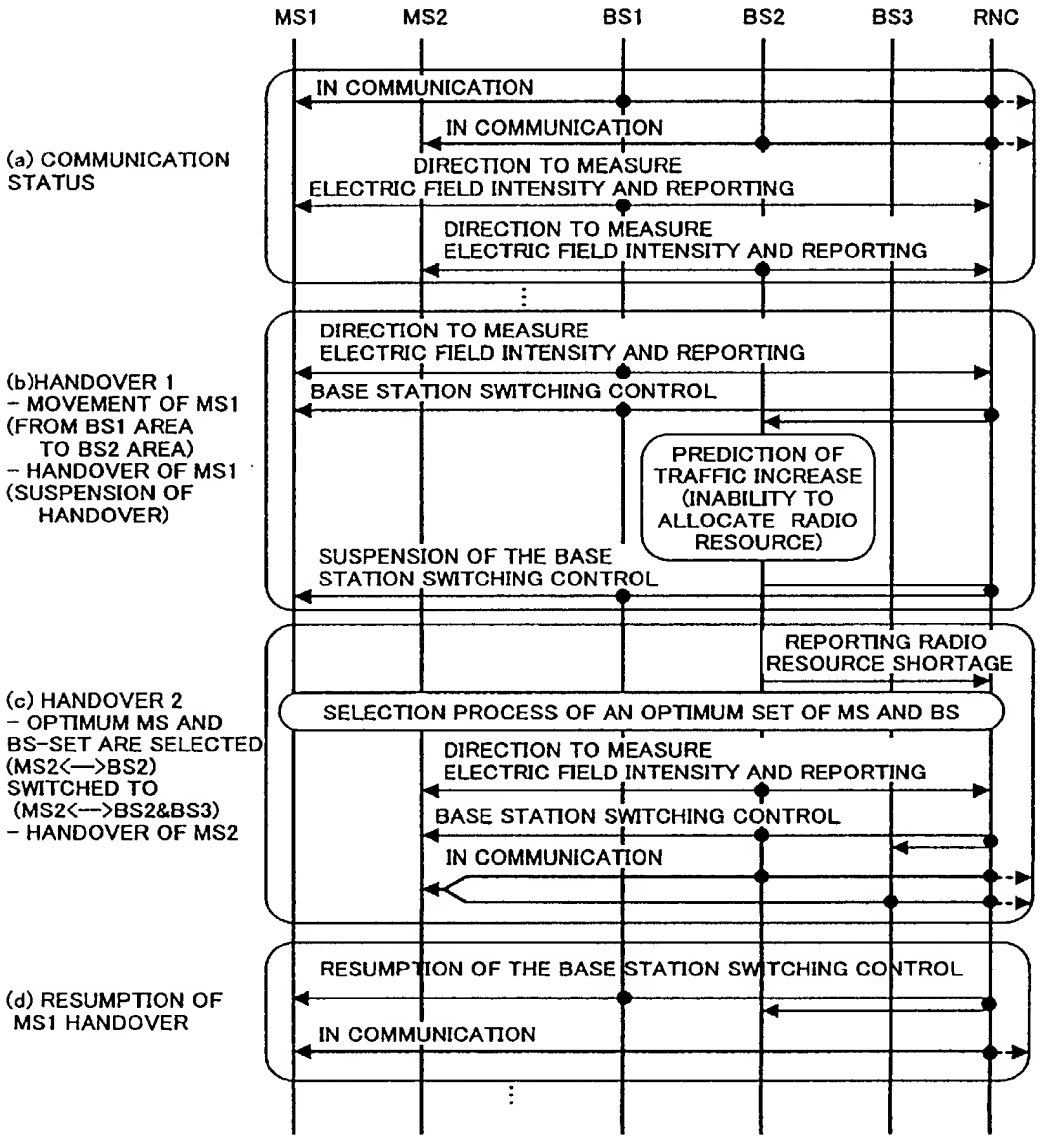

MS1
MS2
BS1
BS2
BS3
RNC
(a) COMMUNICATION STATUS
IN COMMUNICATION
IN COMMUNICATION
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
(b)HANDOVER 1
- MOVEMENT OF MS1 (FROM BS1 AREA TO BS2 AREA)
- HANDOVER OF MS1 (SUSPENSION OF HANDOVER)
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
BASE STATION SWITCHING CONTROL
PREDICTION OF TRAFFIC INCREASE (INABILITY TO ALLOCATE RADIO RESOURCE)
SUSPENSION OF THE BASE STATION SWITCHING CONTROL
REPORTING RADIO RESOURCE SHORTAGE
(c) HANDOVER 2
- OPTIMUM MS AND BS-SET ARE SELECTED (MS2<—>BS2) SWITCHED TO (MS2<—>BS2&BS3)
- HANDOVER OF MS2
SELECTION PROCESS OF AN OPTIMUM SET OF MS AND BS
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
BASE STATION SWITCHING CONTROL
IN COMMUNICATION
(d) RESUMPTION OF MS1 HANDOVER
RESUMPTION OF THE BASE STATION SWITCHING CONTROL
IN COMMUNICATION

FIG.12

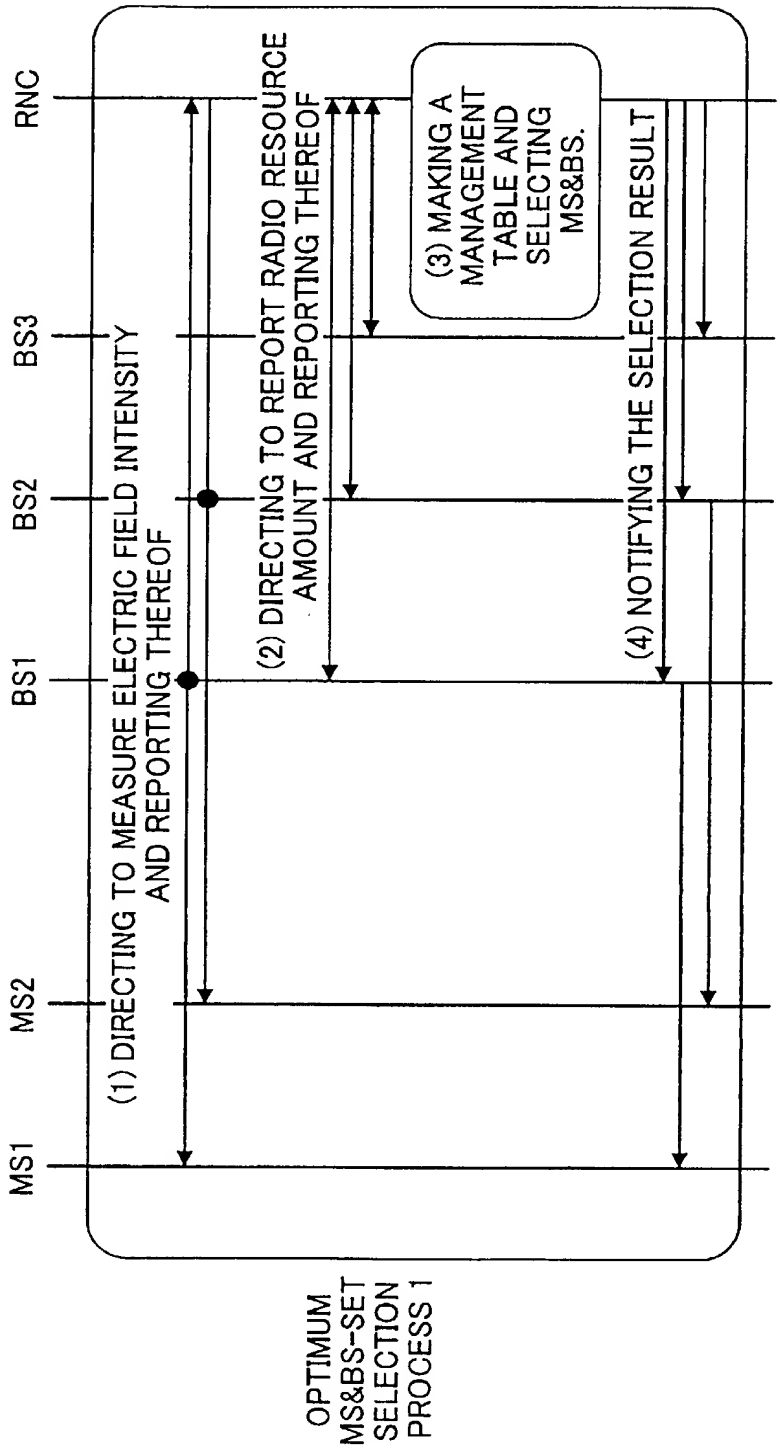

RNC
BS3
BS2
BS1
MS2
MS1
(1) DIRECTING TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING THEREOF
(2) DIRECTING TO REPORT RADIO RESOURCE AMOUNT AND REPORTING THEREOF
(3) MAKING A MANAGEMENT TABLE AND SELECTING MS&BS.
(4) NOTIFYING THE SELECTION RESULT
OPTIMUM MS&BS-SET SELECTION PROCESS 1

FIG.13

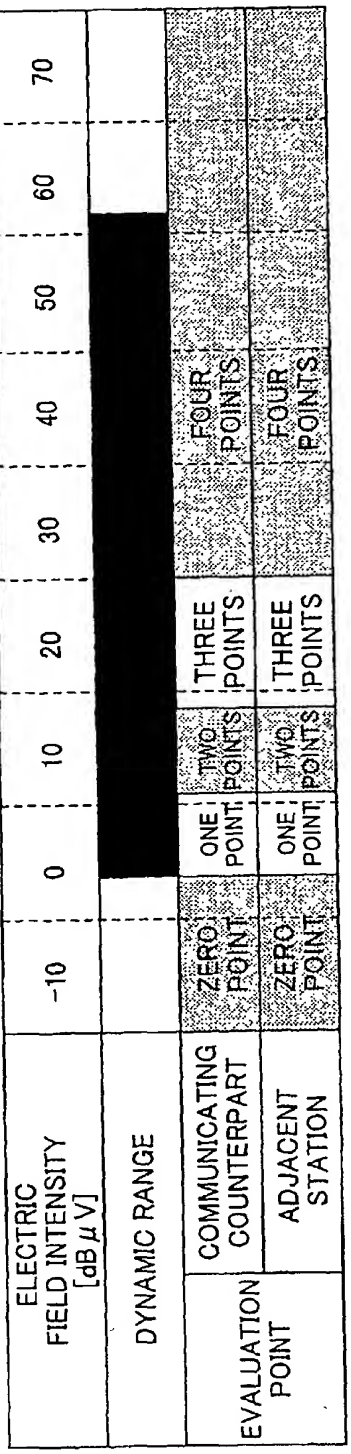

ELECTRIC FIELD INTENSITY [dBμV]
-10
0
10
20
30
40
50
60
70
DYNAMIC RANGE
EVALUATION POINT
COMMUNICATING COUNTERPART
ADJACENT STATION
ZERO POINT
ONE POINT
TWO POINTS
THREE POINTS
FOUR POINTS

FIG.14

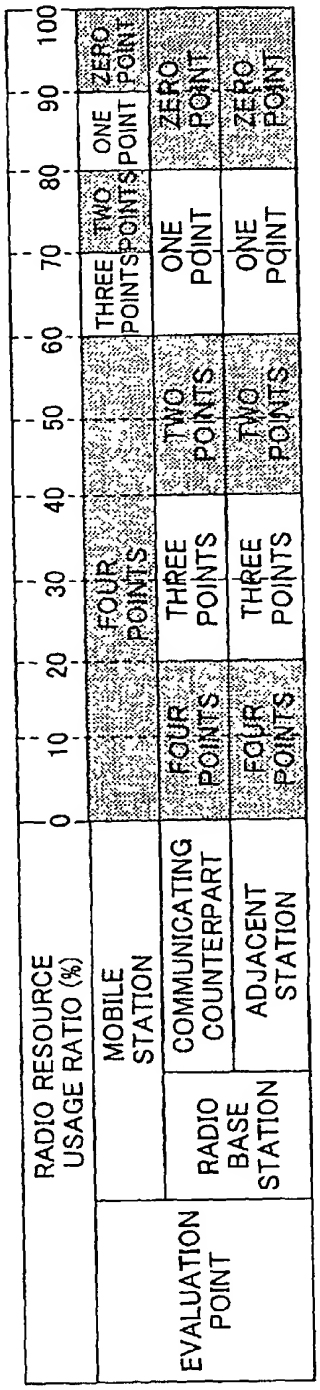

RADIO RESOURCE USAGE RATIO (%)
0
10
20
30
40
50
60
70
80
90
100
EVALUATION POINT
MOBILE STATION
RADIO BASE STATION
COMMUNICATING COUNTERPART
ADJACENT STATION
FOUR POINTS
THREE POINTS
TWO POINTS
ONE POINT
ZERO POINT

FIG.15

	ONE RADIO BASE STATION		TWO RADIO BASE STATIONS		THREE RADIO BASE STATIONS	
	OWN STATION	ADJACENT STATION	INCLUDING OWN STATION	ADJACENT STATION ONLY	INCLUDING OWN STATION	ADJACENT STATION ONLY
EVALUATION POINT	5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT	0 POINT

FIG.16

	COMMUNICATION WITH ONE BS					COMMUNI-CATION WITH 2 BSs	COMMUNI-CATION WITH 3 BSs
	COMMUNI-CATING COUNTER PART	ADJACENT STATIONS					
	BS2	BS1	BS3	BS4	···		
MS1	$y21+\varepsilon D$	$y11+\varepsilon D$	···	···		z	····
MS2	$y22+\varepsilon D$	$y12+\varepsilon D$	···	···		···	····
MS3	$y23+\varepsilon D$	$y13+\varepsilon D$	···	···		···	····
MS4	$y24+\varepsilon D$	$y14+\varepsilon D$	···	···		···	····
⋮							

FIG.17

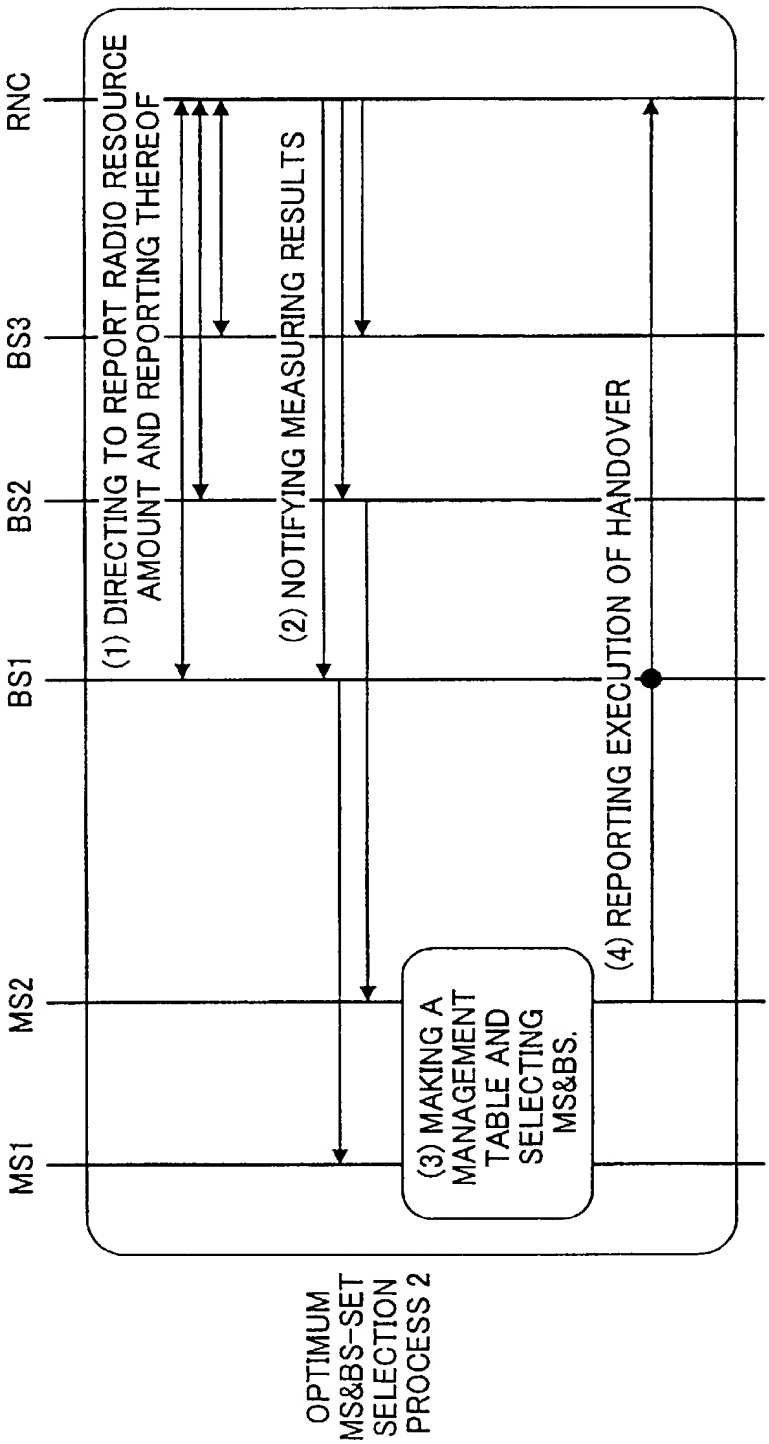

RNC
BS3
BS2
BS1
MS2
MS1
(1) DIRECTING TO REPORT RADIO RESOURCE AMOUNT AND REPORTING THEREOF
(2) NOTIFYING MEASURING RESULTS
(3) MAKING A MANAGEMENT TABLE AND SELECTING MS&BS.
(4) REPORTING EXECUTION OF HANDOVER
OPTIMUM MS&BS-SET SELECTION PROCESS 2

FIG.18

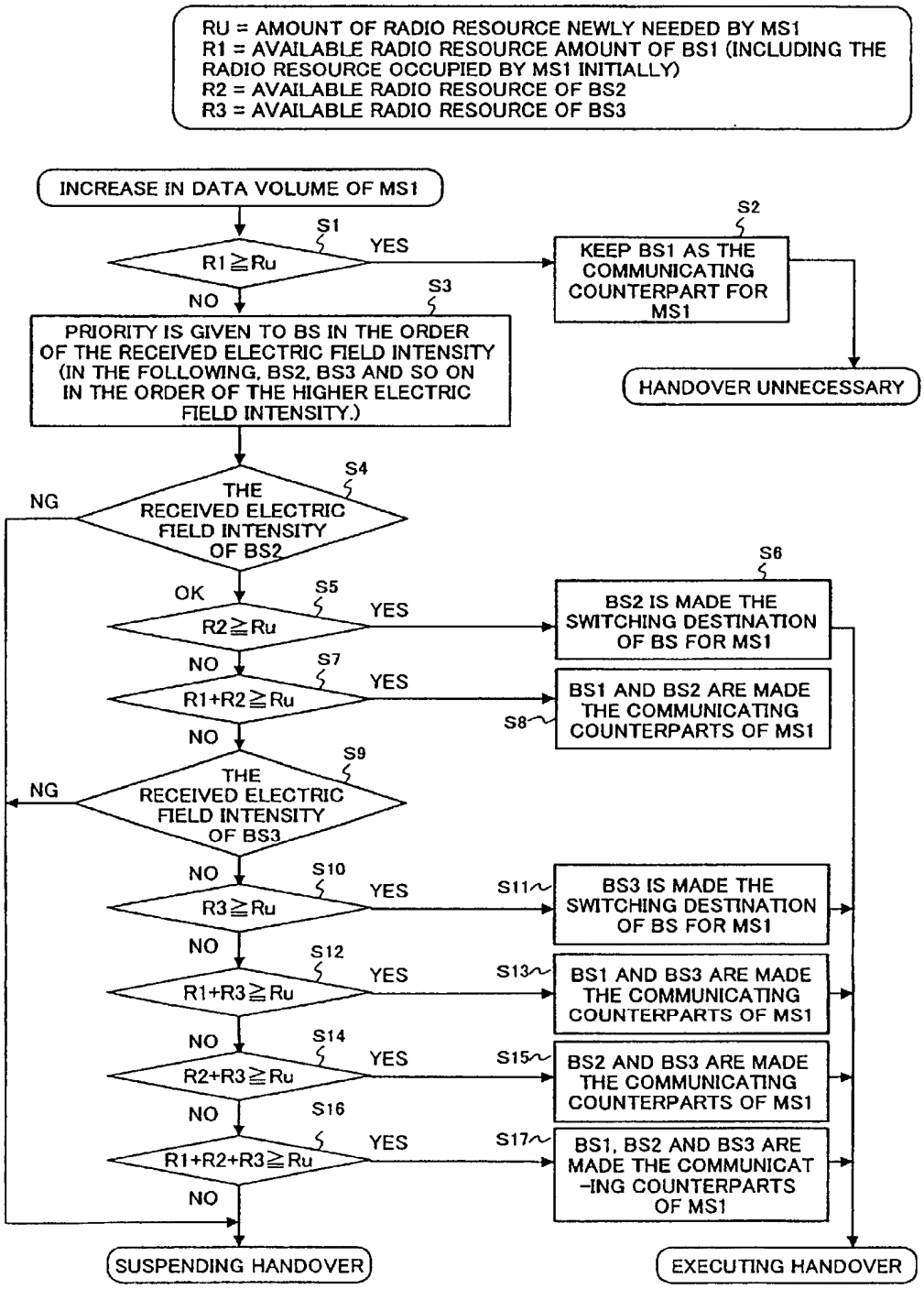

RU = AMOUNT OF RADIO RESOURCE NEWLY NEEDED BY MS1
R1 = AVAILABLE RADIO RESOURCE AMOUNT OF BS1 (INCLUDING THE RADIO RESOURCE OCCUPIED BY MS1 INITIALLY)
R2 = AVAILABLE RADIO RESOURCE OF BS2
R3 = AVAILABLE RADIO RESOURCE OF BS3
INCREASE IN DATA VOLUME OF MS1
S1
R1≧Ru
YES
S2
KEEP BS1 AS THE COMMUNICATING COUNTERPART FOR MS1
HANDOVER UNNECESSARY
NO
S3
PRIORITY IS GIVEN TO BS IN THE ORDER OF THE RECEIVED ELECTRIC FIELD INTENSITY (IN THE FOLLOWING, BS2, BS3 AND SO ON IN THE ORDER OF THE HIGHER ELECTRIC FIELD INTENSITY.)
S4
THE RECEIVED ELECTRIC FIELD INTENSITY OF BS2
NG
OK
S5
R2≧Ru
YES
S6
BS2 IS MADE THE SWITCHING DESTINATION OF BS FOR MS1
NO
S7
R1+R2≧Ru
YES
S8
BS1 AND BS2 ARE MADE THE COMMUNICATING COUNTERPARTS OF MS1
NO
S9
THE RECEIVED ELECTRIC FIELD INTENSITY OF BS3
NG
NO
S10
R3≧Ru
YES
S11
BS3 IS MADE THE SWITCHING DESTINATION OF BS FOR MS1
NO
S12
R1+R3≧Ru
YES
S13
BS1 AND BS3 ARE MADE THE COMMUNICATING COUNTERPARTS OF MS1
NO
S14
R2+R3≧Ru
YES
S15
BS2 AND BS3 ARE MADE THE COMMUNICATING COUNTERPARTS OF MS1
NO
S16
R1+R2+R3≧Ru
YES
S17
BS1, BS2 AND BS3 ARE MADE THE COMMUNICAT-ING COUNTERPARTS OF MS1
NO
SUSPENDING HANDOVER
EXECUTING HANDOVER

FIG.19

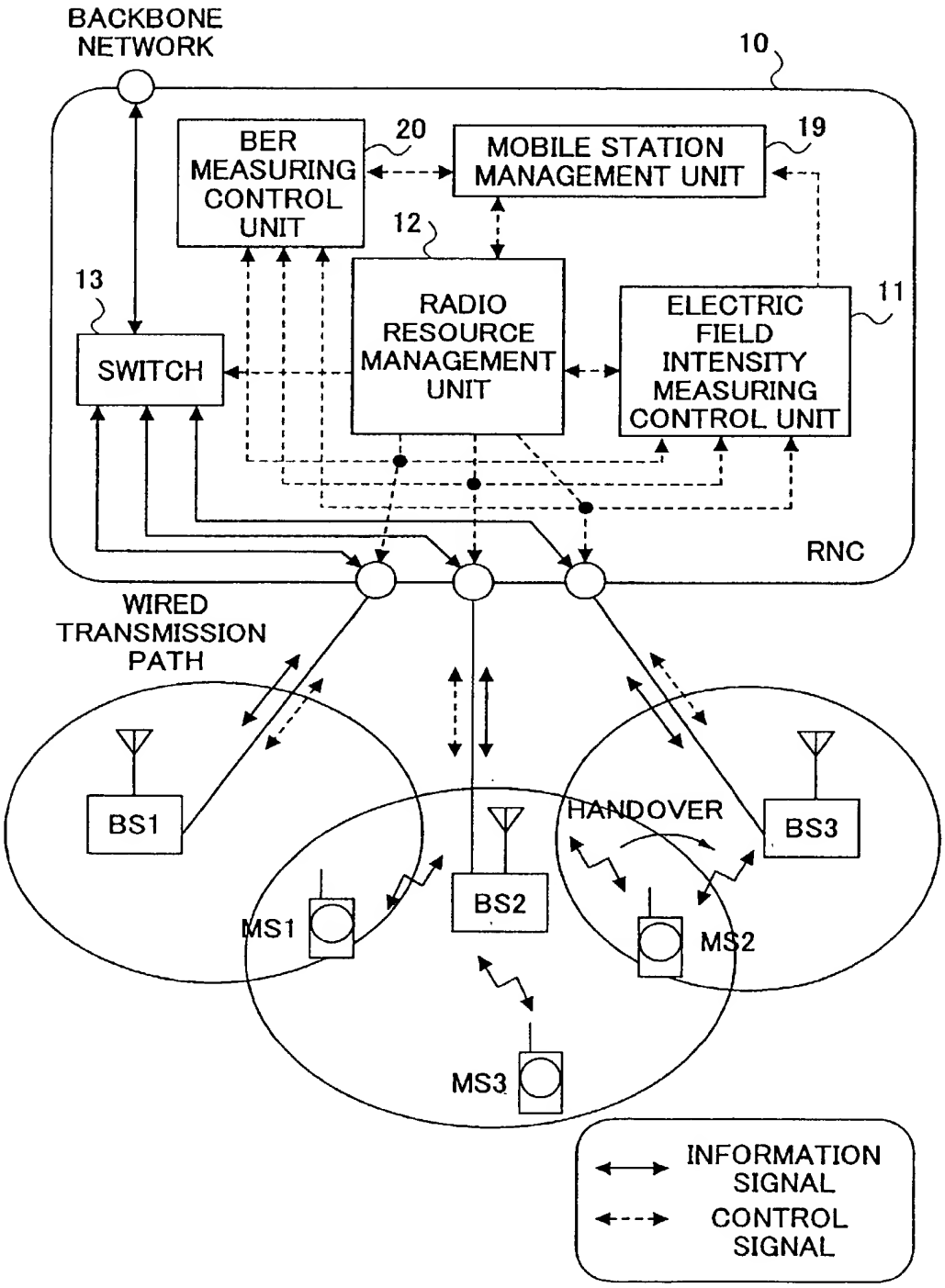

BACKBONE NETWORK
10
BER MEASURING CONTROL UNIT
20
MOBILE STATION MANAGEMENT UNIT
19
12
13
SWITCH
RADIO RESOURCE MANAGEMENT UNIT
ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT
11
RNC
WIRED TRANSMISSION PATH
BS1
BS2
BS3
HANDOVER
MS1
MS2
MS3
INFORMATION SIGNAL
CONTROL SIGNAL

FIG.20

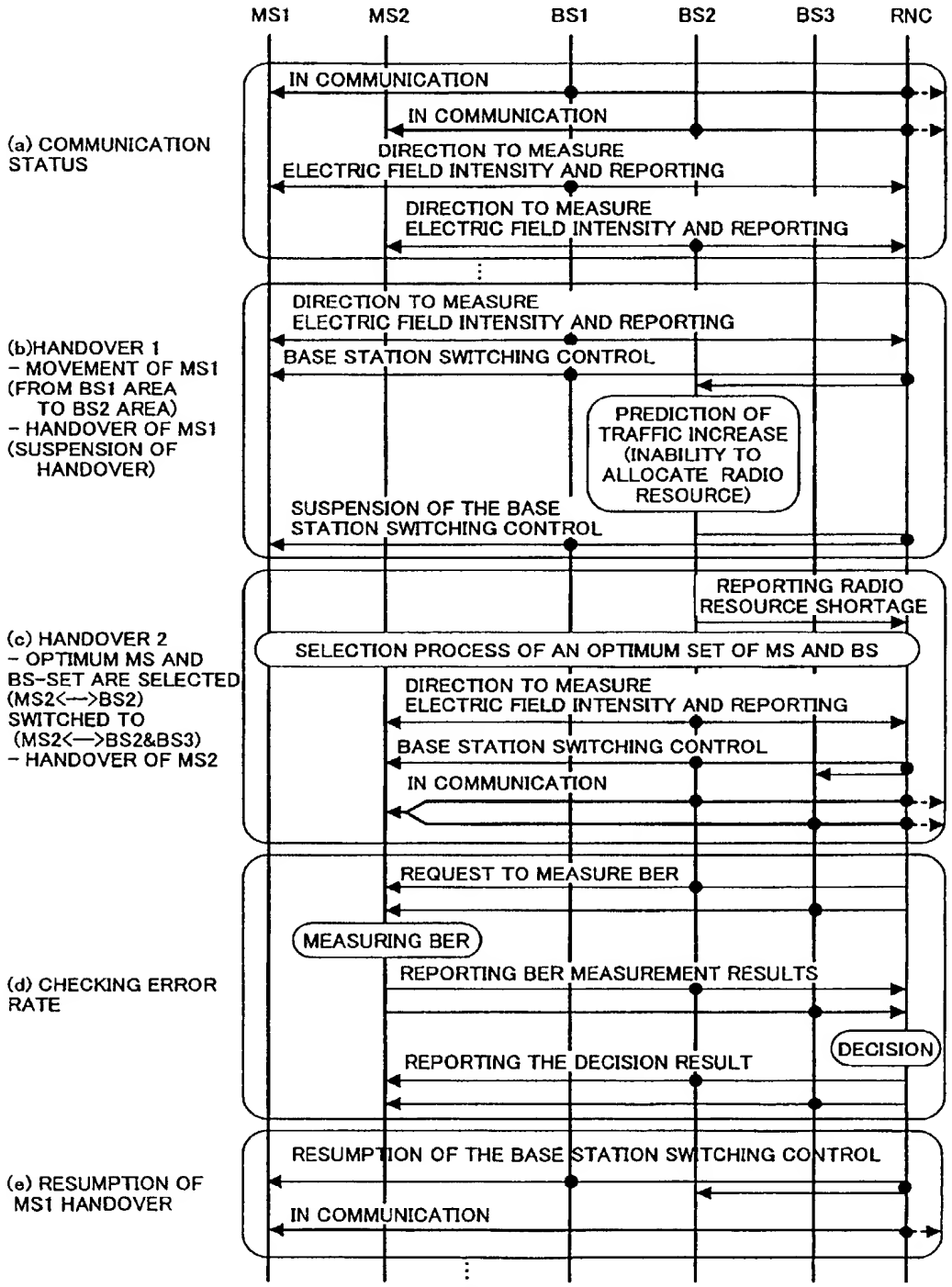

MS1
MS2
BS1
BS2
BS3
RNC
(a) COMMUNICATION STATUS
IN COMMUNICATION
IN COMMUNICATION
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
(b)HANDOVER 1
- MOVEMENT OF MS1 (FROM BS1 AREA TO BS2 AREA)
- HANDOVER OF MS1 (SUSPENSION OF HANDOVER)
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
BASE STATION SWITCHING CONTROL
PREDICTION OF TRAFFIC INCREASE (INABILITY TO ALLOCATE RADIO RESOURCE)
SUSPENSION OF THE BASE STATION SWITCHING CONTROL
REPORTING RADIO RESOURCE SHORTAGE
(c) HANDOVER 2
- OPTIMUM MS AND BS-SET ARE SELECTED (MS2<—>BS2) SWITCHED TO (MS2<—>BS2&BS3)
- HANDOVER OF MS2
SELECTION PROCESS OF AN OPTIMUM SET OF MS AND BS
DIRECTION TO MEASURE ELECTRIC FIELD INTENSITY AND REPORTING
BASE STATION SWITCHING CONTROL
IN COMMUNICATION
REQUEST TO MEASURE BER
MEASURING BER
(d) CHECKING ERROR RATE
REPORTING BER MEASUREMENT RESULTS
DECISION
REPORTING THE DECISION RESULT
RESUMPTION OF THE BASE STATION SWITCHING CONTROL
(e) RESUMPTION OF MS1 HANDOVER
IN COMMUNICATION

FIG.21

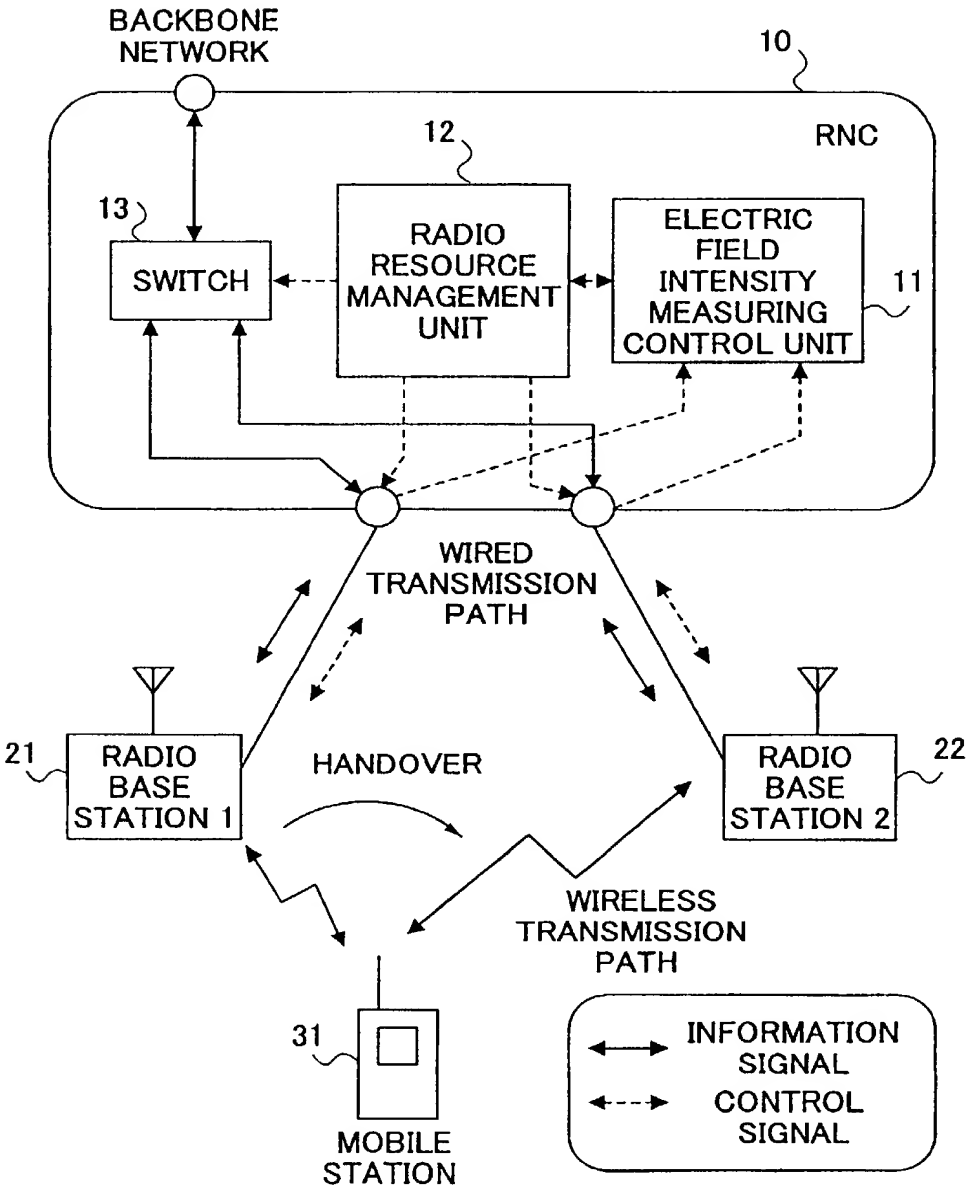
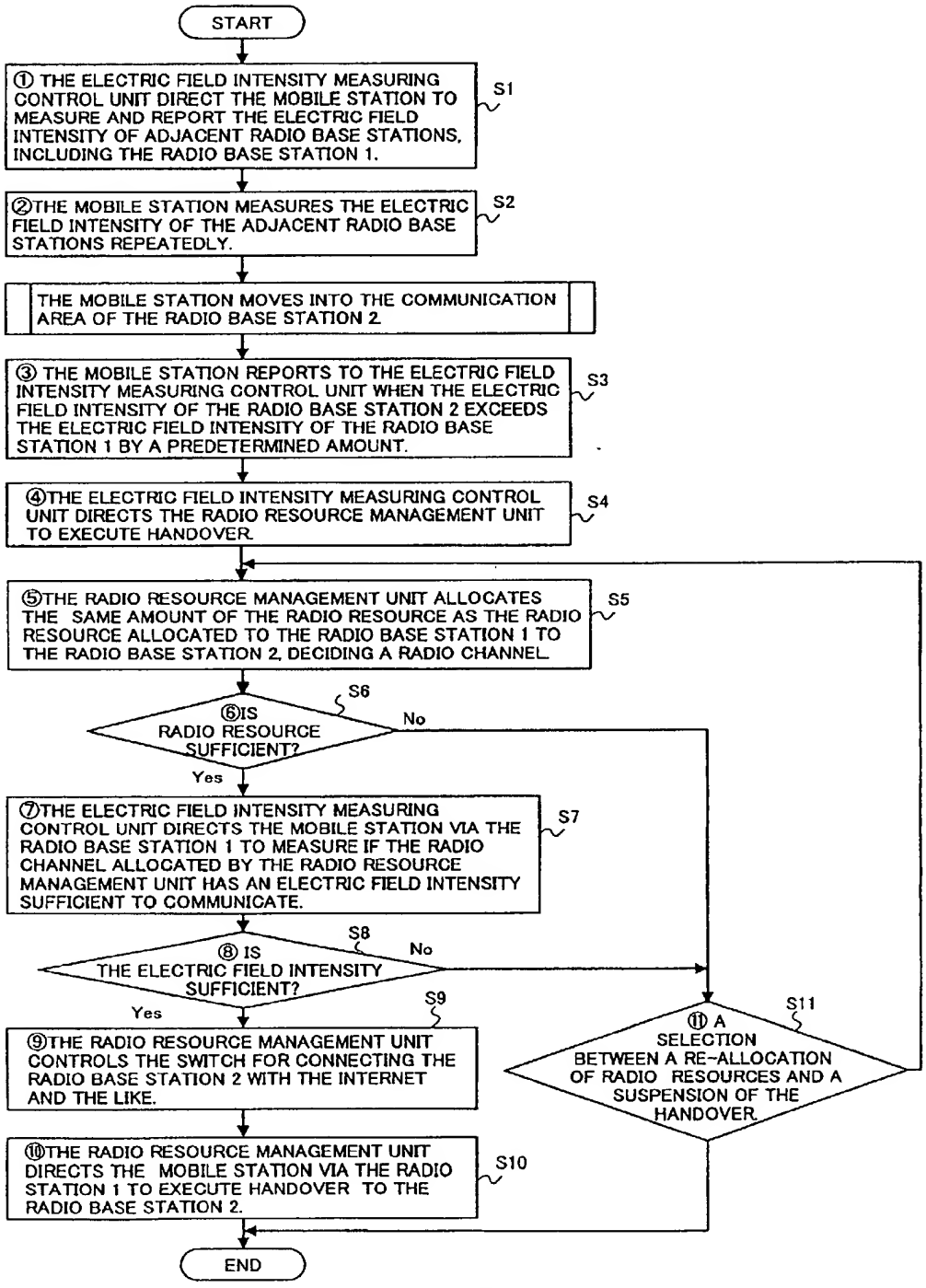

BACKBONE NETWORK
10
RNC
12
13
SWITCH
RADIO RESOURCE MANAGEMENT UNIT
ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT
11
WIRED TRANSMISSION PATH
21
RADIO BASE STATION 1
HANDOVER
RADIO BASE STATION 2
22
WIRELESS TRANSMISSION PATH
31
MOBILE STATION
INFORMATION SIGNAL
CONTROL SIGNAL

FIG.22


START
① THE ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT DIRECT THE MOBILE STATION TO MEASURE AND REPORT THE ELECTRIC FIELD INTENSITY OF ADJACENT RADIO BASE STATIONS, INCLUDING THE RADIO BASE STATION 1.
S1
②THE MOBILE STATION MEASURES THE ELECTRIC FIELD INTENSITY OF THE ADJACENT RADIO BASE STATIONS REPEATEDLY.
S2
THE MOBILE STATION MOVES INTO THE COMMUNICATION AREA OF THE RADIO BASE STATION 2.
③ THE MOBILE STATION REPORTS TO THE ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT WHEN THE ELECTRIC FIELD INTENSITY OF THE RADIO BASE STATION 2 EXCEEDS THE ELECTRIC FIELD INTENSITY OF THE RADIO BASE STATION 1 BY A PREDETERMINED AMOUNT.
S3
④THE ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT DIRECTS THE RADIO RESOURCE MANAGEMENT UNIT TO EXECUTE HANDOVER.
S4
⑤THE RADIO RESOURCE MANAGEMENT UNIT ALLOCATES THE SAME AMOUNT OF THE RADIO RESOURCE AS THE RADIO RESOURCE ALLOCATED TO THE RADIO BASE STATION 1 TO THE RADIO BASE STATION 2, DECIDING A RADIO CHANNEL.
S5
S6
⑥IS RADIO RESOURCE SUFFICIENT?
No
Yes
⑦THE ELECTRIC FIELD INTENSITY MEASURING CONTROL UNIT DIRECTS THE MOBILE STATION VIA THE RADIO BASE STATION 1 TO MEASURE IF THE RADIO CHANNEL ALLOCATED BY THE RADIO RESOURCE MANAGEMENT UNIT HAS AN ELECTRIC FIELD INTENSITY SUFFICIENT TO COMMUNICATE.
S7
S8
⑧ IS THE ELECTRIC FIELD INTENSITY SUFFICIENT?
No
Yes
S9
⑨THE RADIO RESOURCE MANAGEMENT UNIT CONTROLS THE SWITCH FOR CONNECTING THE RADIO BASE STATION 2 WITH THE INTERNET AND THE LIKE.
⑩THE RADIO RESOURCE MANAGEMENT UNIT DIRECTS THE MOBILE STATION VIA THE RADIO STATION 1 TO EXECUTE HANDOVER TO THE RADIO BASE STATION 2.
S10
S11
⑪ A SELECTION BETWEEN A RE-ALLOCATION OF RADIO RESOURCES AND A SUSPENSION OF THE HANDOVER.
END